



APTA STANDARDS DEVELOPMENT PROGRAM  
**RECOMMENDED PRACTICE**

American Public Transportation Association  
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Signal Training Joint Steering  
Committee

# Rail Signals Maintenance Training Content and Standards

**Abstract:** This *Recommended Practice* establishes standards for a program of rail signals maintenance training.

**Keywords:** rail signals, training

**Summary:** The safe and efficient operation of transit rail systems is highly dependent on reliable rail signals to control train operations. Rail signals maintenance has been identified by APTA and unions representing transit workers as a craft with a shortage of practitioners. In response to the need for rail signals maintenance training, the Transportation Learning Center has partnered with APTA, transit agencies and unions representing transit workers to develop joint labor-management training guidelines and recommended training practices.

**Scope and purpose:** The labor-management subject matter experts on the Signal Training Joint Steering Committee developed the training curriculum and guidelines with the expectation that training would be instructor-led and include on-the-job training under the supervision of an experienced and qualified journeyman or technician. Completion of level 100 to 300 learning objectives would typically require a three-year period, though these guidelines do not include instructional hour and on-the-job hours recommendations.

This Recommended Practice represents a common viewpoint of those parties concerned with its provisions, namely, transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any standards, practices or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of a rail transit system's operations. In those cases, the government regulations take precedence over this standard. APTA recognizes that for certain applications, the standards or practices, as implemented by individual rail transit agencies, may be either more or less restrictive than those given in this document.



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## 1. Objective of this standard

Public transportation faces a technical skills shortage driven by changing technologies, shifting workforce demographics, record-breaking growth in ridership and the continuing expansion of transit systems and users. Industry leaders acknowledge that the pace of technological change has surpassed the capacity of most agencies to train skilled technicians and new entrants/employees in the effective diagnosis, repair and maintenance of advanced capital equipment. To address many of these issues, labor-management partnerships have been advocated in a number of blue-ribbon reports (see References) from the Transportation Research Board and its Transit Cooperative Research Program (TCRP) as well as from the American Public Transportation Association (APTA).

The safe and efficient operation of transit rail systems is highly dependent on reliable rail signals to control train operations. Rail signals maintenance has been identified by APTA and unions representing transit workers as a craft with a shortage of practitioners. The inadequate numbers of rail signals maintainers is attributed to several factors, including the pending retirement of incumbent workers, the continued expansion of rail transit systems nationwide and inadequate recruitment and training of signal maintainers. The difficulty in recruiting new entrants into the field is exacerbated by sometimes unfavorable outdoor and confined working conditions and changes in signal technology.

In response to the need for rail signals maintenance training, the Transportation Learning Center has partnered with APTA, transit agencies and unions representing transit workers to develop joint labor-management training guidelines and recommended training practices. The development of these training guidelines was supported through grants from the U.S. Department of Labor, the Federal Transit Administration and the TCRP. In addition, APTA is supporting programs to develop computer-based short courses of study using the recommended training guidelines developed with the Center.

### 1.1 The Steering Committee

The development of recommended training guidelines was coordinated through a joint labor-management steering committee of subject matter experts drawn from rail transit agencies across the country. **Table 1** lists the agencies and unions involved.

**TABLE 1**  
Signal Training Joint Steering Committee Members

State	City	Agency	Union
California	Los Angeles	LACMTA	ATU 1277
California	Sacramento	Sacramento RTD	IBEW 465
California	San Diego	San Diego MTS	IBEW 465
Illinois	Chicago	CTA	IBEW 9
Massachusetts	Boston	MTA	IBEW 103
Pennsylvania	Pittsburgh	Port Authority	ATU 85
New Jersey	Newark	New Jersey Transit	ATU 819
North Carolina	Charlotte	Charlotte Area Transit Systems	
Texas	Dallas	DART	ATU 1338
Washington		Central Puget Sound Regional Transit Authority	ATU 757
<b>Other participants:</b> Brotherhood of Rail Road Signalmen, GE Transportation, Washington Group			

Meeting over a period of two and one-half years, this committee of management and labor subject matter experts:

- Determined the job responsibilities and related tasks required of signals maintainers.
- Determined the skills, knowledge and abilities required to successfully execute the job responsibilities and tasks of the signals maintenance craft.
- Developed a program of training and order of instruction for classroom and on the job training for signals maintainers.
- Determined the learning objectives associated with each phase of the training process to develop signals maintainers.

### 1.1.1 Meeting dates

The Signal Training Joint Steering Committee met on the following dates:

- November 14, 2006
- January 23, 2007
- February 13, 2007
- March 1, 2007
- June 20, 2007
- September 26, 2007
- January 28, 2008
- September 3, 2008
- March 27, 2009

## 2. Rail Signals Training Guidelines

Rail signals maintenance training guidelines are organized into nine subject areas corresponding to the different job responsibilities of a rail signal maintenance technician. These subject areas:

1. Comprehensive overview of rail train operations and safety
2. Train detection and control
3. Switches
4. Grade crossings
5. Power distribution
6. Signals
7. Train stops
8. Interlockings
9. Control panels and human-machine interfaces

The nine areas of the curriculum include content and learning objectives at various levels of difficulty. Level 100 training modules are introductory content and may overlap with other crafts that share a core of basic mechanical, electrical and electronic knowledge. Level 200 training areas are specific to rail signal maintenance and build on the foundation technical knowledge, skills and abilities developed in the level 100 training areas. Level 300 training modules are the more advanced learning objectives imparting skills, knowledge and abilities required for signal technicians and journeyman to execute all of the job responsibilities required of a typical signal maintainer. The training guideline also includes an advanced 400-level component that would apply to the maintenance and troubleshooting skills of an advanced technician.

The labor-management subject matter experts on the Signal Training Joint Steering Committee developed the training curriculum and guidelines with the expectation that training would be instructor-led and include on-the-job training under the supervision of an experienced and qualified journeyman or technician. Completion

of level 100 to 300 learning objectives would typically require a three-year period, though these guidelines do not include instructional hour and on-the-job hours recommendations.

## 2.1 Signals Overview (two modules, levels 100 and 200)

### 100. Overview

- **100-1. History and Purpose of Signal Systems**
  - 100-1-1. Describe how signals are used to maximize capacity of limited track safely
  - 100-1-2. Describe different failures that caused something to be done to improve the system
  - 100-1-3. Describe different systems that have been used throughout history
- **100-2. Fail safe Principles of Signals**
  - 100-2-1. Describe the importance of train order/time tables
  - 100-2-2. Describe how continuous refinements make the system more fail safe
  - 100-2-3. Explain why system has to fail in a safe manner
- **100-3. Introduction to Track Circuits**
  - 100-3-1. Describe normally energized relays on track circuits
  - 100-3-2. Describe normally de-energized relays on track circuits
  - 100-3-3. Explain how most restrictive aspects/a signal set at “danger”
  - 100-3-4. Define and describe the uses of vital relays
  - 100-3-5. Explain reasons for regular inspection and testing of vital relays
  - 100-3-6. Inspect/test vital relays
  - 100-3-7. Perform vital relay testing
- **100-4. Safety Principles**
  - 100-4-1. Describe process of moving people safely
  - 100-4-2. Explain the how the purpose of system is to keep trains from colliding
- **100-5. Rail Roadway Worker Protection**
- **100-6. Safe Train Operation/Expedited Train Movement**
  - 100-6-1. Demonstrate ability to coordinate track related activities with central dispatch
  - 100-6-2. Describe how individuals responsible for own safety
  - 100-6-3. Describe importance of maintaining awareness of your environment
  - 100-6-4. Describe that human communication is a *vital* part of the process; cannot lose sight of those working on the tracks
  - 100-6-5. Describe the importance of human communications to central control to train mechanics to operators and all staff
  - 100-6-6. Describe the overall layout of your system to reduce your personal risk/injury
  - 100-6-7. Describe why there is a need for more reliable system to track the whereabouts of those working on the tracks for safety reasons
  - 100-6-8. Explain function of permissive proceed signal and how it is unique to each system
  - 100-6-9. Explain purpose of slow zone/work zone
  - 100-6-10. Explain results of failure to comply (high risks and dangers)
  - 100-6-11. Explain rules, policy and procedures at your organization
  - 100-6-12. Explain why there is no room for human error
- **100-7. Regulatory/Regulations (Importance of Testing)**
  - 100-7-1. Demonstrate awareness and comply with rules and regulations
  - 100-7-2. Describe different levels of rules and regulations (company, FRA, FTA, levels of government) and the jurisdiction of each
- **100-8. Signal System Operation**